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Action of hexaamminecobalt on the activity of Serratia marcescens nuclease

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Abstract

Using CD spectroscopic and kinetic analysis, a refined mechanism of Co(NH3)6 3+ action on activity of Serratia marcescens nuclease was elucidated. The mechanism was identical with previously found mechanisms of Mg2+ and C7H5O2Hg+. Similarly to Mg2+ and C7H5O2Hg+, Co(NH3)6 3+ binding to the DNA substrate induced changes in the secondary structure which resulted in changes of the enzymatic activity of the S. marcescens nuclease. Upon binding of 0.03 Co(NH3)6 3+ per DNA phosphate, highly polymerized DNA displayed A-form characteristics. The DNA transition from B-form to A-form intermediate was followed by a decrease of the nuclease activity. The diminishing nuclease activity was consistent with diminishing values of Km and Kcat. Co(NH3)6 3+ binding to the highly polymerized DNA caused a 1.7-2.8-fold decrease in Km, and 13.3-19.9 decrease in Vmax compared with Mg-DNA complex. A vast excess of Co(NH3)63+ did not affect the activity of S. marcescens nuclease if the DNA in the assay mixture remained in its B-form conformation. Preincubation of S. marcescens nuclease with Co(NH3)6 3+ did not influence the tertiary structure of the enzyme.

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Keywords

4-(chloromercurio)benzoate, DNA transition from B- to A-form characteristics, Hexaamminecobalt, Magnesium, Nuclease, Serratia marcescens